

SYSTEM FOR LUBRICATING AND COOLING A MECHANICAL ASSEMBLY

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a system for lubricating and cooling a mechanical assembly. Although not exclusively, it is particularly well suited to lubricating and cooling a transmission gearbox, particularly a main transmission gearbox, usually used on board helicopters. Thus, the present invention will be described more particularly hereinafter in relation to this application.

[0002] It is known that, for correct operation, such a transmission gearbox is lubricated and cooled, generally by a device which circulates a lubricating and cooling liquid, such as oil. In addition, to prevent said transmission gearbox from being able to be damaged or even destroyed through lack of lubrication and cooling in the event of this device failing during flight, a backup device is provided whose purpose is to, at least partially, lubricate and cool said transmission gearbox to allow the helicopter to continue to fly for a predetermined survival time.

DESCRIPTION OF THE PRIOR ART

[0003] For example, American patent U.S. Pat. No. 4,717, 000 has already disclosed a system for lubricating and cooling helicopter transmission gearboxes comprising a main device which circulates a stream of oil under pressure through said transmission gearboxes and a backup device which is set in operation automatically or manually when said main device becomes defective. This backup device comprises:

[0004] a reservoir connected to said main device so as to fill with lubricating and cooling liquid from said main device;

[0005] a source of pressurized air, consisting of a compressor stage of the engine of said helicopter; and

[0006] spray nozzles fed, on the one hand, with pressurized lubricating and cooling liquid from said reservoir and, on the other hand, with pressurized gas from said compressor stage, said spray nozzles being able to spray a mist of lubricating and cooling liquid onto certain components of said transmission gearboxes so as temporarily to supplement the defective main device.

[0007] In that known system, the lubricating and cooling liquid is contained in said reservoir at the relatively high pressure (at least 10 bar= 10^{-4} pascal) of the main device and, should the latter fail, is expelled therefrom by the action of the compressed air produced by said compressor stage, the pressure of which has to overcome that of the liquid in the reservoir. The result of this is that the lubricating and cooling liquid sent to said nozzles is at a high pressure, itself equal to at least 10 bar (10^{-4} pascal). In consequence, the backup device consumes a significant amount of lubricating and cooling liquid and the reservoir of the backup device needs to be of large capacity, thus causing its mass and bulk to be high.

[0008] The object of the present invention is to overcome these disadvantages and to make it possible to produce a

lubricating and cooling system which, for a backup device with the same predetermined survival time, requires only a reservoir with a capacity much lower than that of the known system described hereinabove.

SUMMARY OF THE INVENTION

[0009] To this end, according to the invention, the system for lubricating and cooling a mechanical assembly such as a helicopter transmission gearbox, said system comprising:

[0010] a main lubricating and cooling device circulating a stream of lubricating and cooling liquid through said mechanical assembly at a relatively high pressure; and

[0011] an auxiliary backup device set in operation automatically or manually when said main device becomes defective, said backup device comprising:

[0012] at least one reservoir of lubricating and cooling liquid;

[0013] at least one source of pressurized gas;

[0014] at least one spray nozzle which is fed, on the one hand, with pressurized lubricating and cooling liquid from said reservoir and, on the other hand, with pressurized gas from said source, which is able to spray onto a mist of lubricating and cooling liquid said mechanical assembly so as temporarily to supplement the defective main device,

[0015] is notable in that:

[0016] said reservoir of the auxiliary backup device is independent of said main device; and

[0017] said spray nozzle is fed with lubricating and cooling liquid from said reservoir at a pressure at most equal to 2 bar ($2 \cdot 10^{-5}$ pascal).

[0018] What happens, according to the invention, because the reservoir of the auxiliary backup device is independent of the main device, that is to say because it has no hydraulic communication therewith, is that the lubricating and cooling liquid sent to the spray nozzles can be at a pressure far lower than that of the liquid of the main device, at most equal to 2 bar ($2 \cdot 10^{-5}$ pascal) and, preferably, roughly equal to 1 bar (10^{-5} pascal). The result of this is that, for the same predetermined survival time, the consumption of the backup device according to the present invention is far lower than that of the known system, which means that the amount of lubricating and cooling liquid needed for backup purposes is also far lower. As a result, the capacity, the mass and the bulk of the reservoir are considerably reduced.

[0019] Such a low pressure of the lubricating and cooling liquid used for backup purposes may be obtained in various ways. For example:

[0020] the lubricating and cooling liquid contained in said reservoir is pressurized by said source of pressurized gas feeding said spray nozzle, for example a compressor stage of the helicopter engine, and a pressure and flow limiter is arranged between said reservoir and said spray nozzle; or alternatively

[0021] the lubricating and cooling liquid contained in said reservoir is pressurized by an auxiliary gas